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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/643,756	08/18/2003	James Gardner	021245-001000US	3927

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EXAMINER

DSOUZA, JOSEPH FRANCIS A

ART UNIT	PAPER NUMBER
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2611

DATE MAILED: 10/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/643,756

Applicant(s)

GARDNER, JAMES

Examiner

Adolf DSouza

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 - 3, 6 - 11, 14 - 19 is/are rejected.
- 7) ☒ Claim(s) 4 - 5, 12 - 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 August 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application
- ☐ Other: _____.

Drawings

1. The drawings are objected to because:

- In Figure 1, element 16, "Ungerboec" should be changed to "Ungerboeck".
- In Figures 2 and 4, the input "R" into blocks 32 and 202 should be changed to "r" to make it consistent with what is described in the specification.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:

- In the specification (page 3, line 4), "symbol mapper 16" should be corrected to "symbol mapper 14".
- In the specification (page 2, line 4), (page 7, paragraph 27) the dimensions of the complex matrix should be changed to $M_r \times M_t$. Since the y vector shown in the equation on page 3, has dimension $(M_t \times 1)$, the number of columns in the H matrix should be M_t .

Appropriate correction is required.

Claim Objections

3. Claims 1 and 9 are objected to because of the following informalities:

1. In the preamble of the claims, "channel matrix H with M_r columns, wherein the number of rows of matrix H .." should be changed to "channel matrix H with M_r rows, wherein the number of columns of matrix H .."

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 – 3, 6, 8, 9 – 11, 14 – 17, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art in view of Cole (US 4,891,823) and further in view of Kuchi et al. (US 20020126648).

Regarding claim 1, Applicant Admitted Prior Art discloses a method for transmitting data in a multi-input multi-output communications system having at least two transmit antennas and Mr receive antennas, the data adapted to be transmitted via a channel having an associated channel matrix H with M_r rows, wherein the number of columns of matrix H is the same as the number of transmit antennas (see Drawings, Fig. 1, Fig. 2; description of Figures 1 and 2 from paragraphs 9 - 12), the method comprising:

associating each $u+n$ bits of the data with a symbol selected from 2^u labels of 2^n cosets, wherein each symbol is represented by a constellation point on a complex plane (see Drawings, Fig. 1, element 12, 14, 16; Specification, paragraphs 9 - 11).

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Applicant Admitted Prior Art does not disclose arranging (rotating) the constellation points and transmitting the real parts of two symbols on antenna1 and the imaginary parts of two symbols on antenna 2.

In the same field of endeavor, however, Cole discloses arranging the constellation points on the complex plane such that at least some of the arranged constellation points have real components that are distinct from real components of other arranged constellation points and wherein the at least some of the arranged constellation points have imaginary components that are distinct from imaginary components of the other arranged constellation points (column 1, lines 5 – 12; column 3, lines 1 – 8; column 4, lines 32 – 45; wherein the distinct real and imaginary components arise since the constellation points have no point in common).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Cole, in the Applicant Admitted Prior Art because this would allow the use of rotationally invariant codes, as disclosed by Cole.

In the same field of endeavor, however, Kuchi discloses transmitting real components of each pair of associated symbols as an input stream on a first one of the at least two transmit antennas; and transmitting imaginary components of each pair of associated symbols as a second input stream on a second one of the at least two transmit antennas (column 1, paragraph 5).

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Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Kuchi, in the Applicant Admitted Prior Art because this would allow transmit diversity, as disclosed by Kuchi.

Regarding claim 2, Applicant Admitted Prior Art does not disclose that the real symbols are transmitted using the first antenna and that the imaginary symbols are transmitted using the second antenna.

In the same field of endeavor, however, Kuchi discloses the input stream transmitted on the first antenna is defined by

$$x_1 = \text{Re}(\text{Enc}_1) + j * \text{Re}(\text{Enc}_2)$$

and wherein the second input stream transmitted on the second transmit antenna is defined by:

$$x_2 = \text{Im}(\text{Enc}_1) + j * \text{Im}(\text{Enc}_2)$$

(column 1, paragraph 5)

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Kuchi, in the Applicant Admitted Prior Art because this would allow transmit diversity, as disclosed by Kuchi.

Regarding claim 3, Applicant Admitted Prior Art discloses receiving a vector r of the transmitted symbols on the M_r receive antennas, wherein the vector r has M_r

components; and forming a label metric and a distance metric associated with each of the at least two transmit antennas (Drawings, Figure 2; Specification, paragraphs 9 – 12).

Regarding claim 6, Applicant Admitted Prior Art discloses supplying the distance metric and the label metric associated with each transmit antenna to a Viterbi decoder (Drawings, Figure 2; Specification, paragraph 13).

Claim 8 is analyzed similarly to the limitation in claim 1 regarding arranging the constellation points.

Claims 9 – 11, 14 and 19 are directed to apparatus of the same subject matter claimed in the method/steps claims 1 – 3, 6 and 8 respectively and therefore, are rejected as explained in the rejections of claims 1 – 3, 6 and 8 above.

Regarding claims 15 – 17, Applicant Admitted Prior Art does not disclose that the implementation is in software, hardware or a combination.

In the same field of endeavor, however, Cole discloses that the fourth, fifth and sixth modules are software, hardware or software/hardware modules (column 5, lines 10 – 13).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Cole, in the Applicant

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Admitted Prior Art because this would allow implementation in various modes, as disclosed by Cole.

4. Claims 7, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art in view of Cole (US 4,891,823) and further in view of Kuchi et al. (US 20020126648) and Raleigh (US 6,377,631).

Regarding claim 7, Applicant Admitted Prior Art does not disclose interleaving the symbols.

In the same field of endeavor, however, Raleigh discloses interleaving each symbol prior to the transmitting steps (Fig. 1, element 10; column 5, lines 35 – 41).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Raleigh, in the Applicant Admitted Prior Art because this would allow adjacent symbols to be spread by the interleaver, thereby making it more robust to impulse noise, as is well known in the art.

Claim 18 is directed to apparatus of the same subject matter claimed in the method/steps claim 7 and therefore, is rejected as explained in the rejection of claim 7 above.

Allowable Subject Matter

5. Claims 4 – 5, 12 – 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Other Prior Art Cited

The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure.

The following patents are cited to further show the state of the art with respect to MIMO systems and Trellis encoders:

El-Gamal et al. (US 20020122502) discloses Method and system for utilizing space-time overlays for convolutionally coded systems.

Piirainen (US 20030012318) discloses a data transmission method and system using MIMO.

Onggosanusi et al. (US 20030016640) discloses space-time encoded wireless communication system with multipath resolution receivers.

Onggosanusi (US 20030048857) discloses a method using Space-time transmit diversity.

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Stuber (US 20030076777) discloses apparatus and methods for providing efficient space-time structures for preambles, pilots and data for multi-input, multi-output communications systems.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Adolf DSouza whose telephone number is 571-272-1043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



AD

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